SPECIFICATION

The contractor must provide a Single Scanning Probe Microscope (SPM) System **(CLIN 0001)**, that will be used in a clean room, which meets or exceeds the following:

1. ATOMIC FORCE MICROSCOPY (AFM) INSTRUMENTATION

    a. A large sample SPM capable of performing a range of techniques, including contact AFM, lateral force microscopy (LFM), and "intermittent contact" AFM.
    b. The system must rescan at a preprogrammed height above the surface that reproduces the surface profile.
    c. The system must perform tip-sample engagement that eliminates lateral translation of the tip during engagement. The system must detect and image surface changes in elasticity and/or adhesion.
    d. The system must perform simultaneous optical imaging during scanning tunneling or atomic force experiments with a video microscope camera, coupled with a compatible TV display, capable of motorized zoom operation in the range of 20OX to 1500X.
    e. The system must include at least one piezo-electric scanner with 100 μm x-y (or greater) range and 6.5 μm (or greater) z range; a 1% accuracy independent of the scan rate or size; and with less than 1 nm vertical distortion at the edges of a 10 μm scan. For atomic scale resolution, a piezoelectric scanner with a smaller lateral range (~ 10 μm) must be provided. The contractor must use an acoustic hood and/or vibration isolation table to meet these specifications.
    f. The sample holder must accommodate wafers at least 6 inches (150 mm) in diameter and must be capable of vacuum sample hold.
    g. The microscope must scan any portion of this sample holder.
    h. No permanent magnets shall be used in the system that might affect the sample, e.g., no magnets should be required for securing the cantilever holder nor the samples. The cantilever/sample holder capabilities may be accomplished using interchangeable parts but must be easy to use with rapid (no more than 10 minutes) turnaround time.
    i. The system must have silicon nitride contact probes with standard tips and cantilevers. The contractor must provide an assortment of tips and cantilevers for specialized tasks or a single multiple function type satisfying the specifications. A minimum of 100 probes must be provided.

2. SCANNING TUNNELING MICROSCOPY (STM) INSTRUMENTATION

    a. The SPM must perform STM.
    b. The STM must perform atomic scale resolution (with a vibration/isolation table or other suitable means).

3. MAGNETIC FORCE MICROSCOPY (MFM) INSTRUMENTATION

   a. The system must perform MFM with a DEMONSTRATED ability to separate magnetic features from surface topographical features on a wide variety of systems from magnetically hard to magnetically soft materials.
   b. The system must scan the tip at a constant and known height above the sample topography and that the user has control to accurately vary this height.
   c. The MFM must measure not only the amplitude of cantilever oscillation, but also the resonance frequency and phase of the cantilever oscillation.

4. MEASUREMENT STANDARDS

   a. The contractor must provide a variety of standard measurement samples appropriate for the various modes of operation (AFM, MFM, etc.) for verification of operation and calibration.
   b. A description of the particular standard samples must be submitted with the proposal.

5. COMPUTER AND CONTROL SOFTWARE

   a. The system must be computer controlled.
   b. The computer must be a 32-bit or better operating system.
   c. The computer/operating system shall run a host of third party applications as well as the SPM software.
   d. The system must allow for multitasking such that data analysis on previously scanned data can be performed while scanning new data.
   e. The software must allow the user to change scan parameters in the middle of a scan without restarting.
   f. The computer must include 100 base-T capability for networking via TCP/IP.
   g. The system must be capable of printing to a remote network-based printer.

6. WARRANTY

   a. The contractor must provide a standard commercial warranty.
   b. The contractor must provide all software upgrades throughout the life of the instrument.

7. ON-SITE INSTALLATION

   a. The contractor must provide on-site installation at NRL-DC.

8. TRAINING

a. The contractor must provide training on the operation of the system to not more than ten people at NRL-DC. Training will follow within one week of installation.

CLIN 0002 (Option)

Probes

The contractor must provide pricing for different types of compatible probes. Quantities no less than 10 and no more than 1000 probes per package is preferred.

CLIN 0003 (Option)

Printer

The contractor must provide a high quality color ink-jet or laser printer that is compatible with the system for routine output of data.